Matter and Energy: What is matter?

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This photo of John Muir Glacier in Alaska shows two of the three main states of matter: solid (the ice and rock) and liquid (the water). Photo from: Wikimedia Commons.

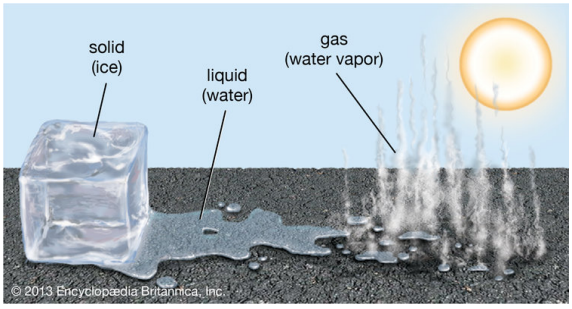
An electron, a grain of sand, an elephant and a massive quasar at the edge of the visible universe all have one thing in common — they are composed of matter. Anything that takes up space is called matter. Air, water, rocks and even people are examples of matter. Different types of matter can be categorized according to their mass. The mass of an object is the amount of material that makes up the object. A bowling ball, for example, has more mass than a beach ball.

States Of Matter

Matter exists in several different forms, called states. The three most familiar states are solid, liquid and gas.

Rocks, books, desks and balls are examples of solids. Matter in the solid state has a set size and shape, and the size and shape do not change easily. For example, when a person moves a book from a smaller to a bigger box, the book looks the same.

Milk, orange juice and water are examples of liquids. In the liquid state, matter has a set size, or amount, but its shape varies depending on its container. For example, milk changes shape when a person pours it from a carton into a glass, but the amount of milk stays the same.



The air and the helium used to fill balloons are examples of gases. Matter in the gaseous state does not have either a set size or a set shape. It can expand to fill a large container, or it can be squeezed into a smaller container.

Matter can change from one state to another. This happens when a substance is cooled or heated to a particular point. For example, heat causes liquid water to evaporate, or turn into water vapor — a gas. The temperature at which a liquid turns into a gas is called its boiling point. The water vapor will change back into liquid when cooled. If it is cooled enough, water will freeze and become a solid. The temperature at which a liquid becomes a solid is called its freezing point. That same temperature can be considered the melting point if the temperature is increasing and causes a solid to become a liquid. For example, liquid water transforms into a solid — ice — when it is cooled to 32 degrees Fahrenheit (0 degrees Celsius). The melting point for ice is the same temperature. Different types of matter have different boiling, melting and freezing points.

Properties Of Matter

All matter has physical properties, which a person can measure without changing the matter. Color, amount, density and temperature are examples of physical properties.

All matter also has chemical properties. A chemical property tells how matter will change under special conditions. For example, certain metals turn to rust if they sit out in the rain, and paper and wood burn to ashes if they touch a flame. Burning and rusting are called chemical reactions. Chemical reactions change matter into new types of matter.

Quiz

1 Read the summary below. Choose the answer that BEST fits into the blank to complete the summary.

Matter is anything that takes up space and has mass. Solids, liquids and gases are the three most familiar states, or forms, of matter. _____. Matter can even turn into new types of matter when exposed to a chemical reaction.

(A) The mass of a bowling ball, for example, is much greater than that of a beach ball.

(B) Both solids and liquids have set sizes, or amounts, but liquids do not have a set shape.

(C) When matter's temperature changes enough, it can change from one state to another.

(D) Metals can turn into rust in the rain, and wood can turn into ashes when burned.

2 How are the three states related to size and shape?

(A) The states are defined by whether they have a set size, a set shape, neither or both.

(B) The states are considered to have mass only if the matter has both a set shape and set size.

(C) The states are classified as matter only if they have no set size or set shape.

(D) The states have no set size or shape until a chemical reaction changes their properties.

3 Which selection from the article highlights a substance that has reached a boiling point?

(A) This happens when a substance is cooled or heated to a particular point.

(B) For example, heat causes liquid water to evaporate, or turn into water vapor — a gas.

(C) That same temperature can be considered the melting point if the temperature is increasing and causes a solid to become a liquid.

(D) For example, certain metals turn to rust if they sit out in the rain, and paper and wood burn to ashes if they touch a flame.

4 Which sentence from the article BEST supports the idea that not all liquids evaporate at the same temperature?

(A) The temperature at which a liquid turns into a gas is called its boiling point.

(B) That same temperature can be considered the melting point if the temperature is increasing and causes a solid to become a liquid.

(C) For example, liquid water turns to a solid form — ice — when it is cooled to 32 degrees Fahrenheit (0 degrees Celsius).

(D) Different types of matter have different boiling, melting and freezing points.